Outreach for Annual Colorectal Cancer Screening

A Budget Impact Analysis for Community Health Centers

David T. Liss, PhD,[1,2] Dustin D. French, PhD,[3,4,5] David R. Buchanan, MD, MS,[6] Tiffany Brown, MPH,[1,2] Bridget G. Magner, MPH,[6] Stephanie Kollar, BA,[6] David W. Baker, MD, MPH[1,2]

Introduction: Fecal immunochemical testing (FIT) is an attractive approach for colorectal cancer screening at community health centers. This budget impact analysis investigated benefits and costs of FIT outreach—with FIT kits mailed to patients, followed by reminders and phone calls—compared with point-of-care (POC) strategies.

Methods: Five screening and cost outcomes were simulated over 1 year at a "base case" community health center serving 1000 screening-eligible patients: (1) FIT completion among patients due for screening; (2) proportion up-to-date on screening; (3) cost per patient due for screening; (4) cost per completed FIT; and (5) total organizational cost. Uncertainty analysis investigated potential savings from optimizing staff workflows during FIT outreach. Data were collected in 2012–2014, with analysis conducted 2014–2015.

Results: Using POC strategies, 24.0% of patients due for screening completed FIT, versus 42.4% under outreach (18.4% absolute difference). When calculations included patients up-to-date on screening from prior colonoscopy, 41.7% were up-to-date via POC, versus 55.8% for outreach (14.1% absolute difference). POC cost $4.93 per patient, versus $30.43 for outreach ($25.50 difference). Cost per patient screened was $20.60 for POC and $71.84 for outreach ($51.24 difference). Total organizational cost was $3,779 for POC distribution and $23,315 for outreach ($19,536 difference). Outreach costs decreased by approximately one fourth under optimized workflows.

Conclusions: Outreach is an effective, practical, relatively low-cost strategy; costs could be reduced further by optimizing staff workflows. Despite its value, outreach costs more than POC distribution and may be difficult for community health centers to implement under current payment models.

Introduction

Screening for colorectal cancer (CRC) is effective,[1–6] cost effective,[7] and potentially cost saving in the context of preventing future cancer care costs.[8] Nevertheless, less than two thirds of Americans aged 50–75 years are up-to-date on CRC screening, and screening rates are particularly low among racial/ethnic minorities and the uninsured.[9,10]

Community health centers (CHCs) can play an important role in addressing current screening disparities. Although CHCs typically do not offer onsite endoscopy, providers can often deliver fecal occult blood testing (FOBT). Multiple outreach strategies have been shown to increase FOBT uptake, such as mailing FOBT

From the [1]Division of General Internal Medicine and Geriatrics, Northwestern University Feinberg School of Medicine, Chicago, Illinois; [2]Center for Advancing Equity in Clinical Preventive Services, Northwestern University Feinberg School of Medicine, Chicago, Illinois; [3]Department of Ophthalmology, Northwestern University Feinberg School of Medicine, Chicago, Illinois; [4]Center for Healthcare Studies, Northwestern University Feinberg School of Medicine, Chicago, Illinois; [5]Veterans Affairs Health Services Research and Development Service, Chicago, Illinois; and [6]Erie Family Health Center, Chicago, Illinois

Address correspondence to: David T. Liss, PhD, Division of General Internal Medicine and Geriatrics, Northwestern University Feinberg School of Medicine, 750 N. Lake Shore Drive, 10th floor, Chicago IL 60611. E-mail: david.liss@northwestern.edu.

0749-3797/$36.00
http://dx.doi.org/10.1016/j.amepre.2015.07.003

kits to patients who are overdue for annual testing[11–14] and patient reminders for FOBT.[11,15] In addition, fecal immunochemical testing (FIT), which has no dietary restrictions and requires only one stool sample, increases screening relative to guaiac-based FOBT.[16,17]

When balancing organizational priorities, CHC administrators need detailed information on potential benefits and costs of interventions to increase CRC screening. No prior studies have examined budgetary impacts of CRC screening interventions in CHC settings. To address this gap in the evidence, a budget impact analysis was conducted that investigated the following outcomes for an evidence-based FIT outreach program, compared with usual care relying on point-of-care (POC) strategies, at a CHC over 1 year:

1. FIT completion among patients due for CRC screening;
2. the proportion of patients who are up-to-date on screening;
3. the cost per patient due for screening;
4. the cost per completed FIT; and
5. total organizational cost.

Methods

This budget impact analysis was conducted in accordance with guidelines from the International Society for Pharmacoeconomics and Outcomes Research,[18] using the perspective of a CHC budgetary decision maker. Study data were collected in 2012–2014; analysis was conducted in 2014–2015. Because CHCs typically operate under an annual budget cycle, a 1-year time horizon was used.

This study compared screening rates and costs for FIT programs using POC distribution or outreach, which have been previously described in detail.[19] In the POC distribution program, if a patient who attended a primary care office visit was due for CRC screening, a medical assistant (MA) provided counseling on CRC screening and offered a FIT kit (sample collection bottle, FIT test strips, and postage-paid return envelope) at the beginning of the visit. In the outreach program, a screening navigator mailed FIT kits when patients became due for annual screening; patients receiving outreach who did not return the FIT at defined intervals received a series of automated reminders and phone calls over 3 months (Figure 1). After 3 months, patients reached by phone who had not yet screened were offered a second mailed FIT kit. Analyses were conducted in Microsoft Excel, version 14.0. Study protocols were approved by Northwestern University's IRB.

Screening rates and costs were projected over 1 year at a "base case" CHC that—to a practical extent—was representative of CHCs nationally. Published national data were used as the basis of assumptions about the prior screening history (i.e., screening behavior before implementation of POC distribution or outreach) of patients at the base case CHC (Table 1). The authors assumed 30% of patients were up-to-date on screening in the prior year, based on the national rate at Health Resources and Services

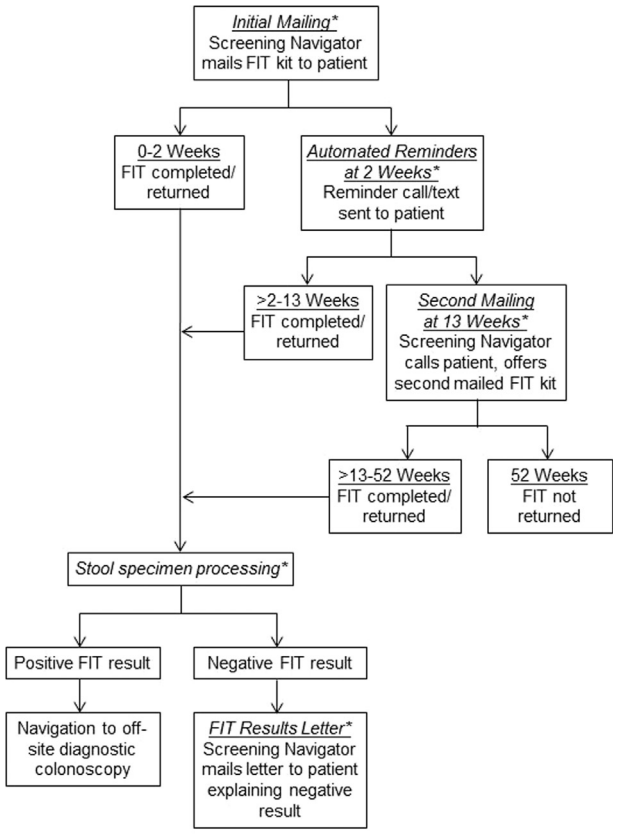

Figure 1. Flow chart of workflows in outreach program.
FIT, fecal immunochemical testing.

Administration–funded health centers.[20] There are no published national estimates of how often CHC patients complete screening using FOBT versus colonoscopy. In the absence of such data, prior usage of each screening modality was estimated based on report of FOBT (14%) and endoscopy (86%) by uninsured Behavioral Risk Factor Surveillance System respondents.[10] Sigmoidoscopy was not considered because it is rarely used by Americans.[9,10]

The authors assumed the base case CHC served 1,000 patients who were eligible for CRC screening. Because patients who screen via colonoscopy should do so every 10 years,[6] it was assumed that 10% of patients who had completed prior colonoscopy would be due for CRC screening over this study's 1-year time horizon. It was assumed that this group would complete FOBT at the same rate as patients who had never screened, whereas the other 90% of patients who had completed prior colonoscopy would remain up-to-date on screening over 1 year and would not be targeted for screening (i.e., screening programs incurred $0 cost for these patients).

Assumptions about FIT completion in the POC distribution and outreach programs were based on empirical findings from two randomized trials the authors conducted at Erie Family Health Center, a CHC based in Chicago IL (Table 1). The first trial was conducted in 2012–2014 among patients who had previously completed FOBT and were due for repeat annual screening ("repeat screening"). In the repeat screening trial, 37.3% of patients in the POC group and 82.2% of patients in the outreach group completed FIT within 6 months.[22] The second trial was conducted in 2013–2014

Table 1. Data Used to Calculate Screening Rates for Point-of-Care and Outreach Programs

Variable	Base case, %	Sources
CRC screening history		
Probability that screening-eligible patients are up-to-date on screening at baseline	30 (range 15–60)	Liss and Baker (2014)[10], HRSA (2012)[20]
Probability of prior colonoscopy versus FOBT, among patients up-to-date at baseline		
Colonoscopy within past 10 years	86 (range 10–90)	Liss and Baker (2014)[10]
FOBT within past year	14 (range 10–90)	Liss and Baker (2014)[10]
Probability of FIT completion over 1 year		
Patients who have never screened		
Point-of-care distribution		
≤2 weeks	2.9	Goldman et al. (2015)[21]
>2–13 weeks	4.8	Goldman et al. (2015)[21]
>13–26 weeks	7.1	Goldman et al. (2015)[21]
>26–52 weeks	7.6	Goldman et al. (2015)[21]
Total (1 year)	22.4	Goldman et al. (2015)[21]
Outreach		Goldman et al. (2015)[21]
≤2 weeks	13.8	Goldman et al. (2015)[21]
>2–13 weeks	13.8	Goldman et al. (2015)[21]
>13–26 weeks	9.1	Goldman et al. (2015)[21]
>26–52 weeks	3.3	Goldman et al. (2015)[21]
Total (1 year)	40.0	Goldman et al. (2015)[21]
Patients due for repeat screening		
Point-of-care distribution		
≤2 weeks	14.7	Baker et al. (2014)[22]
>2–13 weeks	12.0	Baker et al. (2014)[22]
>13–26 weeks	10.7	Baker et al. (2014)[22]
>26–52 weeks	14.7	See text
Total (1 year)	52.0	See text
Outreach		
≤2 weeks	49.8	Baker et al. (2014)[22]
>2–13 weeks	24.0	Baker et al. (2014)[22]
>13–26 weeks	8.4	Baker et al. (2014)[22]
>26–52 weeks	3.1	See text
Total (1 year)	85.3	See text
Probability patient receives FIT kit to complete at home		
Patients who have never screened		

(continued on next page)

among patients who had never completed CRC screening ("never screened"). In the never screened trial, 14.8% of POC patients and 36.7% of outreach patients completed FIT within 6 months; within 1 year, FIT was completed by 22.4% of POC patients and 40.0% of outreach patients.[21]

In both prior trials, the primary outcome was FIT completion within 6 months.[19] Because of the current study's 1-year time horizon, analyses also incorporated the following previously unpublished findings from the repeat screening trial: Between 6 and 12 months of follow-up, 14.7% of patients in the POC group and 3.1% of patients in the outreach group completed FIT. Among patients due for repeat annual screening, the total FIT completion rate over 1 year was 52.0% in the POC group and 85.3% in the outreach group (D Baker, Northwestern University, personal communication, 2014).

The authors made assumptions about FIT distribution among POC patients using empirical data from their prior trials (Table 1). They assumed patients in the outreach program received a FIT kit, via mail, to complete at home. They were unable to track patients' refusal of FIT in the POC program, so FIT distribution rates were derived for POC patients by assuming that POC patients who accepted a FIT kit completed screening at the same rate as outreach patients with the same screening history (i.e., never screened or repeat screening). POC FIT distribution rates were then calculated by dividing the proportion of completed FITs in each POC sample by the total return rate in each respective outreach sample. Based on empirical findings that 73% of POC patients in the never screened trial and 93% of POC patients in the repeat screening trial had any office visits during 1 year of follow-up, it was assumed that POC patients who had any office visits received one instance of MA counseling, at which time they were offered a FIT kit.

Table 1. Data Used to Calculate Screening Rates for Point-of-Care and Outreach Programs *(continued)*

Variable	Base case, %	Sources
Point-of-care distribution	56	See text
Outreach	100	Goldman et al. (2015)[21]
Patients due for repeat screening		
Point-of-care distribution	61	See text
Outreach	100	Baker et al. (2014)[22]
Probability patient receives MA counseling at office visit (point-of-care distribution only)		
Patients who have never screened	73	See text
Patients due for repeat screening	93	See text
Probability second FIT kit mailed at 13 weeks (outreach only)		
Patients who have never screened	38	Goldman et al. (2015)[21]
Patients due for repeat screening	10	Baker et al. (2014)[22]
FIT test characteristics		
Probability of negative test	89	Baker et al. (2014)[22], Goldman et al. (2015)[21]
Probability of positive test	11	Baker et al. (2014)[22], Goldman et al. (2015)[21]

CRC, colorectal cancer; FIT, fecal immunochemical test; FOBT, fecal occult blood testing; HRSA, Health Resources and Services Administration; MA, medical assistant.

The authors assumed all outreach patients who had not completed FIT within 2 weeks were sent automated reminders at that time. Empirical data on FIT distribution from each trial were used to model the frequency that outreach patients were sent a second FIT kit after speaking with the screening navigator at 13 weeks. Empirical trial data on positive and negative FIT results were also used to determine the proportion of outreach patients who completed FIT and were informed of a negative result by mail.

Published prices from a medical supply website[23] were used to estimate FIT kit costs (Table 2). Year 2015 U.S. Postal Service first-class postage rates were assumed, including a postage meter discount. Costs of printed materials and automated reminders were modeled using actual prices paid to a commercial printer and digital reminder service during prior outreach trials (T Brown, Northwestern University, personal communication, 2014).

Personnel costs for processing completed FITs and for POC distribution were estimated by tracking staff efforts at the site of the authors' prior trials. Work by a lab technician to process returned FIT specimens and documentation of test results in the electronic health record was timed (6.5 minutes per returned FIT, $16.20 hourly wage). MA work in the POC program was also tracked by timing relevant patient conversations and documentation (2.0 minutes per patient, $14.00 hourly wage). It was not possible to discretely track screening navigator work because during the prior outreach trials, the screening navigator simultaneously delivered outreach and collected research data. Therefore, the screening navigator estimated the full-time equivalent effort associated with all outreach work, which was converted to minutes (55.5 minutes per patient). Although the screening navigator in our prior trials was compensated at a different level than MAs, outreach protocols do not exceed the clinical scope of MA activities.[24] Therefore, it was assumed that the individual who conducted all outreach was paid at the same level as an MA. Analyses incorporated an assumed 25% fringe rate on top of all hourly wages.

An uncertainty analysis was also conducted that assumed lower personnel costs as a result of optimized screening navigator workflows. Following completion of the prior effectiveness trials, the authors identified numerous opportunities to streamline screening navigator work, such as less frequent mailings (i.e., once-a-month batching of FIT kit mailings to patients who became due for screening, rather than weekly mailings) and reducing—or eliminating—phone calls to patients who had not completed FIT within 13 weeks, given the apparently small yield of these calls.[21,22] The authors felt that under optimized workflows, the screening navigator would devote 30 minutes of outreach work per patient due for screening.

Screening and cost projections were also made for three CHCs whose patients' CRC screening history differed from patients at the base case organization (Table 1). In the first alternative scenario, it was assumed that a low (15%) proportion of CHC patients were up-to-date on screening in the preceding year, but all other assumptions from the base case were maintained. The other two alternative scenarios assumed 60% of CHC patients were up-to-date on CRC screening in the preceding year, matching a recent estimate of the overall U.S. screening rate.[10] A high rate of prior FOBT use at one of these CHCs was assumed, whereby 90% of prior screening was via FOBT (i.e., 54% of all screening-eligible patients) and 10% of prior screening was via colonoscopy (i.e., 6% of all screening-eligible patients). At the other CHC with 60% of patients up-to-date in the prior year, it was assumed that 90% of prior screening was via colonoscopy and 10% via FOBT.

Hypothetical revenues were additionally calculated in a fictional scenario where CHCs were paid on a fee-for-service basis for completed FITs. Appendix 2 (available online) presents further details on traditional differences between CHCs and fee-for-service practices, and the methods used in revenue projections.

Results

Compared with POC distribution of FIT kits, projected CRC screening rates at the base case CHC were substantially higher in the outreach program, but at a much

Table 2. Data Used to Calculate Costs of Point-of-Care and Outreach Programs

Screening program components	Base case cost, $	Sources
Point-of-care distribution		
FIT kit	5.03 per mailing	Medex Supply[23]
Print materials	0.60 per mailing	See text
Return postage	1.44 per mailing	See text
Stool specimen processing	2.20 per returned FIT	Assumption: 6.5 minutes of lab technician effort
MA effort	0.58 per patient	Assumption: 2.0 minutes of MA effort
Outreach		
Initial mailing		
FIT kit	5.03 per mailing	Medex Supply[23]
Print materials	0.75 per mailing	See text
Outgoing/return postage	3.36 per mailing	See text
Automated reminders	0.30 per patient	See text
Automated reminders at 2 weeks	0.30 per patient	See text
Second mailing at 13 weeks		
FIT kit	5.03 per mailing	Medex Supply[23]
Print materials	0.75 per mailing	See text
Outgoing/return postage	3.36 per mailing	See text
Stool specimen processing	2.20 per returned FIT	Assumption: 6.5 minutes of lab technician effort
FIT results letter		
Print materials	0.30 per negative result	See text
Outgoing postage	0.48 per negative result	See text
MA effort	16.18 per patient (range 8.75–16.18)	Assumption: 55.5 minutes of MA effort (lower 30 minutes)

FIT, fecal immunochemical test; MA, medical assistant.

greater cost (Table 3). Twenty-four percent of patients due for screening would complete FIT under POC distribution over 1 year, whereas 42.4% of patients due for screening would complete FIT under outreach (18.4% absolute difference). The projected proportion of patients up-to-date on screening after 1 year—including those up-to-date via prior colonoscopy—was 41.7% for POC distribution and 55.8% for outreach (14.1% absolute difference). On a per-patient basis, outreach cost $25.50 more than POC distribution ($30.43 vs $4.93), largely because of MA effort costs that were $15.75 higher ($16.18 vs $0.43). The cost per patient screened was also much higher for outreach than for POC distribution ($71.84 vs $20.60, $51.24 difference). The projected total organizational cost over 1 year was $3,779 for POC distribution and $23,315 for outreach ($19,536 difference).

In uncertainty analysis, decreased personnel costs led to a sizable decrease in the cost of outreach. Compared with original base case projections, outreach costs decreased by approximately one fourth under optimized outreach workflows, both in terms of cost per patient screened (Appendix 1, Figure A1 [available online]) and total organizational cost (Appendix 1, Figure A2 [available online]).

Screening and cost projections for other CHCs were largely similar to base case projections, but outreach was particularly effective at the CHC with high prior FOBT use (Appendix 1, Table A1 [available online]). Because 54% of screening-eligible patients at the CHC with high prior FOBT use were due for repeat annual screening—and these patients have particularly high rates of FIT completion via outreach[22]—this CHC had the highest screening rate among patients due for screening (65.9%) and lowest cost per patient screened ($45.14) in outreach projections. At all three alternative CHCs, the projected cost per patient due for screening only differed marginally (i.e., <$1) from base case projections for each

Table 3. Projected Screening and Costs Over 1 Year for FIT Screening Programs at Base Case CHC

Base case outcomes[a]	Point-of-care distribution	Outreach	Difference
Projected screening rates (%)			
Proportion of patients due for screening who complete FIT[b]	24.0	42.4	18.4
Proportion up-to-date on colorectal cancer screening	41.7	55.8	14.1
Projected costs ($)			
Cost per patient due for screening	4.93	30.43	25.50
Cost per patient screened via FIT	20.60	71.84	51.24
Total organizational cost	3,779	23,315	19,536

[a]We assumed that the base case CHC served 1,000 screening-eligible patients, 766 of whom were due for screening over 1 year and 234 of whom remained up-to-date due to prior colonoscopy.
[b]Calculations exclude patients who are up-to-date on screening due to prior colonoscopy.
CHC, community health center; FIT, fecal immunochemical test.

respective screening program. The CHC with high prior colonoscopy had the lowest projected total organizational cost ($2,573 for POC distribution, $15,600 for outreach) because of the high proportion of patients who remained up-to-date via prior colonoscopy (these patients would not be targeted in either screening program).

In a hypothetical scenario assuming CHCs receive fee-for-service reimbursement for completed FIT, projected revenues were higher for outreach than POC distribution, but not nearly enough to compensate for the additional cost of outreach (Appendix 2, Table A2 [available online]). These results were consistent across different levels of assumed insurance coverage.

Discussion

After 1 year of a FIT outreach program, the projected CRC screening rate at three of four hypothetical CHCs was similar to the overall U.S. rate of 60%. In the POC distribution program, the projected screening rate was at least 10% less than that of outreach. However, the outreach program costs substantially more than POC, both overall and in terms of cost per patient screened.

This budget impact analysis demonstrates that outreach is a practical and relatively low-cost CRC screening strategy. In simulations based on prior randomized trials, the cost per completed FIT via outreach ranged between $45.14 and $74.29, and screening costs were higher in CHCs with more patients who had never screened. If outreach programs are in place for multiple years, the authors expect the cost per patient screened would incrementally decrease each year as more patients who had never previously screened initiate an annual FIT regimen (i.e., transition from "never screened" status to being due for repeat annual FIT).

Expected costs of FIT outreach compare favorably to costs of colonoscopy. In a Colorado program that provided free colonoscopy to uninsured patients, medical services cost $998 per patient and navigation to colonoscopy cost $185 per patient ($1,183 combined).[25] If these cost estimates were applied to a screening program that delivers colonoscopy every 10 years, colonoscopy would cost about $118 per year, far exceeding FIT outreach.

However, current cost and revenue structures generally disincentivize outreach programs at CHCs.[26] Even if FIT outreach is globally cost saving compared with colonoscopy, many CHCs will probably be unable to pay for outreach. These organizations may therefore need to continue to rely on POC strategies, despite the relatively low effectiveness of this approach to screening.

Findings from the authors' prior work[21,22] and this study's uncertainty analysis show that outreach costs could be further reduced by automating or eliminating some outreach navigator tasks. CHCs could pursue several approaches to optimizing navigator work while making only a small impact on screening rates, such as:

1. Using POC strategies for patients who have never screened, given the relatively small effect of outreach in this group[21];
2. waiting an additional 3 months to deliver outreach to patients due for repeat screening (i.e., 15 months since the most recent FIT), as many of these patients already receive FIT at in-person clinic visits around the time of their annual due date for FIT[22]; or
3. establishing partnerships with private laboratories (which can bill insurers on a fee-for-service basis), thus shifting some outreach costs to other organizations.

These changes could substantially decrease required navigator effort, potentially resulting in even less than 30 minutes of navigator work per patient.

Limitations

This analysis has several limitations. First, randomized trial data used for projections were collected from one CHC that had had a POC distribution program in place for several years.[19] Because it would probably take several months to standardize POC workflows to the degree achieved at the CHC where these trials were conducted, the 1-year screening estimates for the POC program may be high. Second, the authors assumed that patients who were due for screening following prior colonoscopy completed FIT at the same rate as patients who had never screened. As completion of prior colonoscopy demonstrates a willingness to undergo an invasive form of CRC screening, for these patients the estimated screening rate is probably low, while the estimated cost per patient screened is probably high. Third, this study did not include costs of primary care provider effort in the POC program, even though providers probably need to address issues that arise when patients receive MA counseling during in-person visits. Fourth, the authors did not include costs of navigation to diagnostic colonoscopy following a positive FIT result, which apply to both outreach and POC strategies. At the organization in which the prior outreach trials were conducted, patients with positive FIT results are navigated to offsite diagnostic colonoscopy through a separate program beyond the scope of outreach navigator work. Although this program was not included in the current study's simulations, it is crucial that diagnostic colonoscopy is prioritized in FOBT screening programs. Fifth, the uncertainty analysis investigating decreased personnel costs assumed screening rates would not change as a result of optimized navigator workflows. If elements of the outreach program, such as phone calls to patients who had not completed FIT within 13 weeks, are removed or replaced with low-cost alternatives (e.g., additional automated reminders), screening rates in the outreach group could be affected.

Conclusions

Outreach is highly effective and has the potential to reduce disparities in CRC screening. However, outreach has significant attendant costs that may be problematic for CHCs. POC strategies are much less expensive than outreach, but will not allow CHCs to increase screening rates to the same level as the broader U.S. population. New funding streams will probably be needed to make outreach fiscally feasible for CHCs. Potential opportunities to explore include supplements to visit-based reimbursement, quality bonus payments within patient-centered medical homes or accountable care organizations, and other incentives to maximize CRC screening and overall clinical preventive service delivery.

Funding support was provided by the Agency for Healthcare Research and Quality (P01 HS021141).

No financial disclosures were reported by the authors of this paper.

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Appendix

Supplementary data

Supplementary data associated with this article can be found at http://dx.doi.org/10.1016/j.amepre.2015.07.003.